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Original article

Parity and metabolic syndrome in middle-aged Iranian women: a cross-sectional study

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Abstract

Background: The hormonal changes that happen during pregnancy may have effects on weight, blood pressure, dyslipidaemia, and possibly metabolic syndrome. The aim of this study was to determine the association between parity and metabolic syndrome in middle-aged women in Babol, Iran.

Methods: A total number of 800 women, with the age range of 30 to 50, were selected through a systematic random sampling method and sampling propionate to size from Babol. The metabolic syndrome was diagnosed based on the criteria set by the National Cholesterol Education Program (NCEP) III. The individuals' socio-demographic characteristics, the number of live births, pregnancies, lifestyles, current physical activity, and dietary factors were assessed. Logistic regression was used to determine the independent association between parity and the prevalence of metabolic syndrome.

Results: The data were obtained from 633 participants (79.1%). The women, who reported a history of gravidity or parity, had a mean score of 2.4 ± 1.0. One hundred and ten (110, 17.4%) women had less than two parities and 523(82.6%) had two or more parties. Women who developed metabolic syndrome were more likely to have a higher parity at the time of interview (p= 0.001). Women with ≥ 2 parity had significantly higher odds of metabolic syndrome (OR= 1.91, 95% CI= 1.08-3.37). In addition, logistic regression analyses were then performed to assess the association of parity with each component of the metabolic syndrome. The women with ≥ 2 parity were significantly more likely to have abdominal obesity (p= 0.010).

Conclusion: Higher parity or gravidity was associated with higher prevalence of metabolic syndrome in middle-aged women. Health policy makers should work with health providers to reduce the risk of metabolic syndrome in middle-aged multipar women.

Keywords: Metabolic syndrome, Parity, Women

Introduction

MetabolicSyndrome is a serious health concern in both developed and underdeveloped countries. It includes hypertension, hypertriglyceridemia, low HDL-cholesterol, insulin resistance, and obesity (1-4). The prevalence of the metabolic syndrome has increased tremendously over the past decades (5). Lifestyle factors including nutrition, physical activity, socioeconomic status, and number of pregnancy may influence the development of risk factors in metabolic

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syndrome (6-8). Pregnancy may be considered to have a permanent effect on the body mass index and may promote weight gain, hypertension, dyslipidemia, and metabolic syndrome in later life (1,6, 9-11). Since the increase in parity can be associated with the increase in the length of lactation, it can, as a result, bring about higher abdominal obesity and metabolic syndrome. But, several studies have shown that the length of lactation was associated with lower abdominal obesity, lower prevalence of type 2 diabetes, and lower prevalence of metabolic syndrome among parous women (12-14).

We hypothesized that the number of parity or gravidity is associated with a higher prevalence of metabolic syndrome. Little is known about the relationship between parity and the risk of metabolic syndrome later in life among women living in developing countries. Therefore in a cross sectional study, we examined the association between parity and the prevalence of metabolic syndrome among highly parous women later in life in Babol, Iran.

Materials and Methods

This study was approved by Ethics Medical Research Committee of Uiversiti Putra Malaysia and Babol University of Medical Sciences. The research design of this study was a population-based cross-sectional study, which aimed at determining the effect of parity on the prevalence of metabolic syndrome among women later in life. The main outcomes of the present study were variables including the number of live births and pregnancies, other reproduction history, socio-demographic and lifestyles factors, anthropometry measurements, blood pressure, and biochemical indices (lipid profile). The Data collection phase began in Primary Healthcare Centers (PHCs) in Babol. A total number of 633 women, within the age range of 30 to 50 from fourteen active urban primary healthcare centers in Babol, were selected through a systematic random sampling method and sampling proportionate to size.

Written informed consent was obtained from all participants in the study. A face-to-face household interview was conducted by trained skillful co-researchers. Data on the number of parity or number of full term pregnancy, other reproduction-associated factors and socioeconomic and lifestyles factors were collected through the interview-administered questionnaire. The population was, then, divided into two groups, according to parity. Parity was regarded as any pregnancy lasting longer than 20 weeks and is defined as fewer than two and two or more pregnancies.

The weights of the women under study were recorded through digital scales nearest to 100 gram with the participants minimally clothed and without shoes. The heights were also measured with a tape measure (15). The BMI was, as a result, calculated through the formula [BMI= weight (kg) / the square height (m)] (16).

The criteria by the National Cholesterol Education Program (NCEP) III criteria were used to classify subjects with metabolic syndrome. According to the ATP III guidelines, woman would be classified as having metabolic syndrome if they possessed any of the three following criteria: 1) waist circumference >88 cm, 2) serum triglycerides≥ 150 mg/dL, 3) blood pressure ≥130/85 mmHg, 4) HDL-cholesterol< 50 mg/dL, and 5) serum glucose ≥ 110 mg/dL(17).

A food frequency questionnaire was also used to assess individual’s habitual intake. Physical activities were measured through the original International Physical Activity Questionnaires Long form. Thus, logistic regression was also used to determine the independent association of parity on the prevalence of metabolic syndrome.

All analyses were performed through SPSS software (Version 16.0, Chicago, IL, USA). The differences in the distribution of the women by parity for socio-demographic characteristics, smoking, reproductive and body mass index variables were tested by mean and Chi-Square tests. The mean BMI (with 95% CIs) were reported for categories of parity and where appropriate, for other factors. Measurement variables for <2 and ≥2 parity group were compared through the t-test. The multiple logistic regressions were used to determine the effect of factors that were associated with obesity. The odds ratio (OR) was presented together with 95% confidence intervals. The following potential confounders were included in the statistical models for the main analyses: age (continuous variable), marital status (married, single), education (less than elementary level, at least elementary level), occupation (house wife, working), menopausal status and economic status (combination of variables, including occupation, education, income,

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and saving, no saving), parity associated with metabolic syndrome were analyzed.

Results

Out of the total 800 women under study, 167 with missing live birth or metabolic syndrome data were excluded from the study. The final sample included 633 women with the age range of 30 to 50 and a response rate of 79.1%. The women reported a history of gravidity or parity, with the mean of 2.4 ± 1.0. One hundred and ten (110, 17.4%) women had less than two parities and 523(82.6%) had two or more parties. Women who developed metabolic syndrome had a higher parity at the time of the interview (p = 0.001), higher age (p = 0.039), higher income (P = 0.031), higher body mass index (P = 0.0001), lower daily caloric intake (P = 0.009), and lower education level (p= 0.001) (table 1). Pearson correlations coefficient was used for all participants, and found parity positively correlated with current BMI (r = 0.172, p <0.0001), waist circumference (r = 0.211, p <0.0001), systolic blood pressure (r = 0.165, p < 0.0001), fasting levels of glucose (r = −0.09, p < 0.01), and triglycerides (r = −0.06, p < 0.01). The parity was not associated with diastolic blood pressure, total cholesterol, LDL cholesterol, and HDL cholesterol.

Table 1. Characteristics of stratified by presence or absence of metabolic syndrome

	Without metabolic syndrome[a] (N=457) Mean±SD	**With metabolic syndrome (N=176) Mean±SD**	**P- value[b]**
Parity	2.3±0.9	2.6±1.1	0.001
Age (years)	39.3±6.0	40.4±6.1	0.039
Income (Toman/m)	262.4±192.7	229.2±164.1	0.031
Current and Ex-smokers	193(32.8)	83(39.2)	0.097
Body mass index[c]	28.9±4.7	31.0±4.4	0.0001
Daily caloric intake	3119.3±1102.0	2540.8±897.9	0.0001
Total physical activity	5063.6±3788.3	6012.7±4188.6	0.009
	N(%)	**N(%)**	
Education level (years)			0.001
Less than elementary level	307(67.2)	141(70.8)	
At least elementary level	150(32.8)	35(19.9)	
Occupation			0.486
House wife	404(88.4)	159(90.3)	
Working	53(11.6)	17(9.7)	
Marital status			0.437
Married	438(95.8)	171(97.2)	
Single (divorce/widowed/unmarried)	19(4.2)	5(2.8)	
menopausal status			0.620
Non menopause	518(88.1)	184(86.8)	
Menopause	70(11.9)	28(13.2)	

[a] Dichotomous variables were created for each component of the metabolic syndrome based on the National Cholesterol Education Program (NCEP) III criteria.

[b] Continuous variables presented as mean (standard deviation) with p-values calculated by t-tests. Categorical variables presented as n (%) with p-values calculated by Chi-Square test.

[c] BMI; body mass is weight/height^2 (kg/m2)

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Logistic regression analyses were performed to assess the association of parity with metabolic syndrome. The women with ≥ 2 parity had significantly higher prevalence of metabolic syndrome: unadjusted OR of 1.92 (95% CI=1.14-3.22). This association remained significant after adjusting for age, smoking, menopausal status, socioeconomic status, physical activity, daily caloric intake, and education status: adjusted OR 1.91, 95% CI= 1.08-3.37. There were no statistically significant interactions between parity and any covariate. Logistic regression analyses were then performed to explore the association between parity and each metabolic syndrome component. The women who had ≥ 2 parity were significantly higher likely to have elevated abdominal obesity (p = 0.010). No significant association was found for women with ≥ 2 parity with elevated blood pressure, impaired fasting blood glucose, elevated triglycerides, and low HDL-cholesterol (table 2).

Discussion

Our study has shown that the rate of metabolic syndrome in middle-aged women is significantly higher with increasing parity. As it is estimated that the association between the risk of metabolic syndrome and the number of births can persist after adjustment for age, socioeconomic status, and lifestyle factors, when we examined the association of parity on the individual components of metabolic syndrome, we found that parity was associated with significantly higher odds of elevated abdominal obesity. This finding is in agreement with our observation of a positive association of parities and obesity (18). However, in this study, we did not find a significant correlation between low HDL cholesterol, elevated blood pressure, impaired fasting blood glucose, and elevated triglycerides after adjusting risk factors for potential confounders. There is, however, one study that has shown that increasing in parity is associated with increasing in blood pressure, fasting blood glucose, triglycerides, abdominal obesity, and metabolic syndrome in Iranian women (19). Increasing parity can increase the risk of miscarriage, termination of pregnancy and duration of breast-feeding. The mechanisms for the association between metabolic syndrome and multi-parities are not known. There are no biological mechanisms to suggest that they are associated with the metabolic syndrome. But it is suggested that increased gestational weight gain and postpartum weight retention are independently associated with increased prevalence of metabolic syndrome later in life (6,19, 20). However, Cheo et al. (21) reported no relationship between the number of parity and metabolic syndrome.

This study has several limitations which are as follows: First of all, it was cross-sectional and, as a result, was not possible measure for high school obesity, the length of lactation, abortion, termination of pregnancy and metabolic syndrome prior to pregnancies. Secondly, there was a causal relationship between parity and the metabolic syndrome in this study. Thirdly, thyroid status made the researchers

Table 2. Impact of parity (<2/≥2) on metabolic syndrome and components of metabolic syndrome, adjusted for multiple covariates

Model Outcome[a]	Odds Ratio[b]	95% CI	P- value
ATPIII-defined metabolic syndrome	1.91	1.08-3.37	0.025
Abdominal obesity [c]	1.87	1.16-3.00	0.010
Blood pressure ≥130/85 mmHg	2.30	0.82-6.42	0.113
Fasting blood glucose ≥110 mg/dl	1.02	0.43-2.43	0.962
Triglycerides ≥150 mg/dl	1.31	0.81-2.12	0.266
Low HDL cholesterol <50 mg/dl	1.356	0.87-2.11	0.175

[a] Logistic regression models adjusted for age, smoking, menopausal status, socioeconomic status, physical activity, daily caloric intake, education status, and BMI.

[b]Odds ratio for history of ever parity as predictor of each model outcome in analyses adjusting for multiple covariates

[c]Abdominal obesity: waist circumference >88 cm for women.

exclude individuals with a history of thyroid dysfunction. On the other hand, the inclusion of physical activity status, diet quantity, and diet quality of the women were considered as merits of this study.

Conclusions

The findings of this study suggest that increasing parity was associated with increasing of abdominal obesity and metabolic syndrome. The focus of the government in Iran is on increasing parity and there is a strong relationship between metabolic syndrome and parity. This association is mostly marked after the second pregnancy. In addition, abdominal obesity is strongly associated with metabolic syndrome. Therefore, health professionals and policy makers should focus on decreasing abdominal obesity. A follow-up evaluation to monitor health, especially among parous women, is required to control pregnant women by health staff such as midwives and general practitioners. Despite all the limitations, this study hopes to provide guidelines in an attempt to motivate and enhance the developing health education and health promotion programs regarding the prevention of metabolic syndrome and its control, especially among parous women, by health staff such as dietician, general practitioners and midwives in the Primary Health Centers. Further research is required for the confirmation and verification of the obtained results.

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Conflict of interest

None declared.

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